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# Postharvest Handling Technical Bulletin

## EDDOE

### Postharvest Care and Market Preparation



Technical Bulletin No. 22

April 2004

# **POSTHARVEST HANDLING TECHNICAL SERIES**

## **EDDOE**

### **Postharvest Care and Market Preparation**

Ministry of Fisheries, Crops and Livestock  
New Guyana Marketing Corporation  
National Agricultural Research Institute

Technical Bulletin No. 22

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With the assistance of the United States Agency for International Development

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## **Preface**

This publication is part of a series of technical bulletins that seeks to provide specific recommendations for improvements in postharvest care and market preparation for selected non-traditional agricultural products. The intended audience for this series is primarily extension agents.

Initial market assessments in current export markets and visits with producers and exporters in Guyana have shown the quality of fresh produce currently exported is uneven and in some instances very poor. Stages all along the export chain from harvest and pre-harvest to transportation and final export are all in need of improvement. Pre-harvest practices, sanitation at the packinghouse, packaging, bacterial and fungal problems, and transportation were all identified as areas where improvement could benefit the quality and increase the shelf life of Guyana's fresh produce exports. The technical bulletins address these issues specific to each product. Harvesting techniques and crop maturity indices are provided. Preparation for market, including cleaning, sorting, packing and transportation are covered. The bulletins address and recommend specific storage conditions, covering temperature and humidity controls. Finally the bulletins address postharvest diseases and insect damage.

The undertaking of these technical bulletins is a joint effort of the Ministry of Fisheries, Crops and Livestock; the New Guyana Marketing Corporation (NGMC) and the National Agricultural Research Institute (NARI) to improve quality, increase production and promote exports. As a team, the three agencies are working on the problems, limitations, and constraints identified in the initial reconnaissance surveys, from production and postharvest handling problems, to packaging and transportation, to final market.

## **Introduction**

Eddoe (*Colocasia esculenta* var. *antiquorum*) is the principal ground provision grown in Guyana. It is grown primarily for the corm or swollen stem base. The main eddoe type grown produces one large corm encircled with rings. Eddoe may also be known as taro or dasheen in international markets. It is a member of the aroid family. Another member of this family grown in Guyana is tannia (*Xanthosoma sagittifolium*), also known as yautia or malanga. Postharvest care recommendations are similar for tannia and eddoe.

Eddoe has a large central corm and may produce many small edible cormels attached to the central corm. Eddoe is cylindrical to barrel-shaped and may grow to a length of 35 cm (14 in) with a diameter up to 15 cm to 20 cm (4 in to 6 in). The skin is purplish-brown to brown and the flesh is white. Eddoe is available year round and is a rich source of carbohydrate, mostly in the form of starch. Postharvest life depends on the amount of tissue damage and wounding received during harvesting and market preparation, in addition to the storage temperature and relative humidity.

## **Harvest Maturity Indices**

Several different indices can be used to determine harvest maturity of eddoes. The length of time from planting is commonly used to estimate harvest maturity. A minimum of six months of plant growth is generally required before the eddoes are ready for harvest, but this may be extended to 8 or 9 months after planting, depending on the growing conditions, cultivar, and desired market size. Several representative and randomly selected plants can be dug at periodic intervals to estimate the average eddoe size in the planting.

Another commonly used index of harvest maturity is the vegetative condition of the plant. Corm maturity is indicated by wilting and dying of the outer leaves and shortening of the length of the petiole. As the corms approach maturity, the lower leaves begin to turn yellow and senesce. Harvesting should begin when the majority of plants have naturally senesced and the foliage has yellowed or desiccated. A few randomly selected plants should be harvested to ensure that the eddoes are well formed. Eddoe can remain in the ground several months after foliage senescence, allowing the corms to enlarge further. However, as the eddoe ages, the central pith tissue becomes woody and inedible. Harvest should not be delayed for too long after attainment of maturity.

Corm size is the other principal index of harvest maturity. When eddoes have nearly reached their full size, they often begin to push out of the soil surface. This is usually an indication that the crop should be harvested soon. Randomly selected plants can be harvested to determine if the corms have reached the desired size.

## Harvest Methods

Eddoe is typically harvested by hand by lifting the lower part of stem in a shaking motion and pulling the plant out of the ground. A harvest tool suitable to the soil type (i.e. fork or cutlass) is generally needed to facilitate lifting of the enlarged storage organ out of the ground. Care must be taken during the harvest process to minimize damage to the corm, as this greatly reduces market life. Eddoe is very susceptible to mechanical damage and bruising. Once harvested, any large pieces of adhering soil should be gently rubbed off the eddoe surface. The stem should be cut back to right above the shoulder of the corm if the eddoe is to be marketed immediately. A slightly longer length of stem, protruding above the shoulder by about 2 to 3 cm (1 inch), should be left attached to the corm if it will be cured and put into storage. All seriously injured, partially decayed, or unmarketable corms should be out-graded in the field at the time of harvest.

Marketable corms should be carefully put into appropriate harvest container and taken to a shaded and well-aerated collection area or packing site. Harvested eddoe should not remain on the ground exposed to full sun. The ideal harvest containers are well-ventilated wooden crates or durable plastic containers. Stuffing eddoes into large synthetic fabric sacks is not desirable (Figure 1). The sacks are typically filled tightly with 50 kg (110 lbs) or more of product. This can result in a considerable amount of bruising and surface abrasion to the eddoes as the large sacks are piled on top of each other during loading, transport, and unloading.



**Figure 1. Considerable amount of bruising occurs in eddoes packed in large field sacks.**

Eddoe is not a crop that lends itself readily to mechanical harvesting. However, the stalks can be cut with a topping machine, and the roots can be lifted with a mechanical harvest aid. Mould-board plows have been used to uproot the plant, making hand harvest less tedious. A mechanical harvester has been developed in Brazil. It grabs onto the stem and lifts the plant from the ground.

## Curing

Depending on the market, eddoes should be cured for prolonged storage or cleaned, graded, and packed for more immediate sales. Proper curing of eddoes immediately following harvest is an effective way to extend storage life, although the benefits of curing are not as pronounced as they are with sweetpotatoes or other ground provisions. Curing is a process in which the skin thickens and new tissue forms beneath the surface of injured areas in the corm. Curing reduces postharvest water loss and minimizes decay during storage. The optimal conditions for curing eddoes are holding the corm at 26.5°C to 30°C (80°F to 86°F) and high relative humidity (90% to 95%) for several days

immediately following harvest. Eddoes can be cured outdoors if piled in a partially shaded area. Cut grasses or straw can be used as insulating materials and the pile should be covered with canvas, burlap or woven grass mats.

Eddoes should never be washed or scraped clean prior to curing and/or storage, as this will promote decay. A short length of petiole 2 cm to 3 cm (0.8 inch to 1.2 inch) should be left attached to the corm during curing. This will minimize the likelihood of microbial infection and decay at the severed neck end of the corm. The tail end of the corm should also be cut back to leave a 1.3 cm (0.5 inch) stalk. After the brief curing period, eddoe should be stored in well-ventilated bins or crates, and washed only prior to packing for market.

### **Temperature Control**

The ideal storage temperature for eddoes is 11°C (52°F). At this temperature, properly cured and healthy corms can be stored for 3 months. Holding eddoes at ambient temperature will significantly shorten the storage life. Intact corms will typically remain in a marketable condition for only up to 3 weeks at 22°C (72°F). However, eddoes that have been cut off at the ends and/or had the skin removed will have a potential market life of only 2 weeks due to a higher rate of postharvest decay and weight loss. Temperatures above 15°C (59°F) lead to sprouting and a high weight loss. Ideally, eddoes should be stored in well-ventilated crates stacked at least 10 cm (4 inch) off the floor and 15 cm (6 inch) from the wall of an enclosed structure. About 2.5 cm (1 inch) should be left between stacks for air movement.

For traditional low input storage of eddoes, the corms should be placed in pits lined with coconut husks or banana/plantain leaves, covered with the same materials and then sealed at the top with soil or leaves. Above-ground piles may also be constructed. The piles should be covered with a protective structure or put under a roof to keep out rainfall.

### **Relative Humidity**

Moisture loss, corm shriveling, and softening are common postharvest problems with eddoes. Also, eddoe is mostly sold by weight and any moisture loss which occurs during storage will directly reduce the potential economic return for the crop. In order to minimize these problems, the relative humidity (RH) should be maintained at 90% to 95% throughout the storage period. This is especially important for eddoes that have their skin removed and ends cut off (i.e. those destined to Barbados). These corms will have a rapid rate of water loss through the cut and scraped surfaces. A high storage RH can be obtained by covering the corms with leaves, straw or other vegetative material. Use of supplemental humidifiers is an effective way of obtaining a high RH inside enclosed storage areas that are well insulated. Storage at a RH above 95% is not recommended because of the possible development of surface discolouration and mould growth.



## Preparation for Market

### *Cleaning*

The surface of the eddoe should be sufficiently cleaned to meet market expectations. For the domestic Guyanese market, excess soil should be removed from the eddoe surface with a soft brush or cotton gloves. Dead root tissue should be removed. The skin should not be scraped with a knife nor should the basal part of the corm be cut (Figure 2). Open wounds will significantly reduce the potential storage life. The protruding fibers should be rubbed off the surface of eddoes destined for export.

The surface of eddoes destined for Barbados have to be thoroughly scraped clean, followed by washing (Figure 3). This creates numerous open wounds in the eddoe tissue and significantly diminishes potential market life. Nevertheless, it is a Barbadian requirement for all eddoes exported to Barbados.



**Figure 2. Intact skin and ends of eddoes allow for a longer domestic marketing period.**



**Figure 3. Scraping of the eddoe surface is required for exports to Barbados.**

Eddoes should be washed if the market requires it (i.e. Barbados), or if the corms are heavily contaminated with soil. The wash water should be clean and sanitized with 150 ppm hypochlorous acid (household bleach). In addition, the wash water pH should be maintained at 6.5 in order for the hypochlorous acid to have its maximum strength. The corms should remain in the chlorinated wash water for 30 seconds to 1 minute. The sanitized wash water should be changed regularly to prevent the build-up of soil particles and micro-organisms. Where the export market permits, the eddoes can be further protected against postharvest decay by dipping in a 500 ppm benomyl or 1000 ppm thiabendazole fungicide solution after the eddoes have been cleaned. After washing and/or fungicide application, the surface of the eddoes should be thoroughly dried by placing them on a screen or mesh table in a well-ventilated area (Figure 4).





**Figure 4. Drying of the eddoe surface is necessary before packing.**

### *Grading*

Damaged and partially decayed corms should be removed from those intended for market. Sound corms of uniform size and shape should be packed in each carton (Figure 5). High quality eddoes are large, dark brown, and fresh in appearance. The corms should not be soft, spongy, or puffy. They should be free of visible dirt, mechanical damage, and surface mould. Export markets typically require large sized eddoes between 1 kg to 1.5 kg (2.2 lbs to 3.3 lbs) in weight. Specific sizes depend on the particular market and import requirement. The corms should have an intact skin over the entire surface, no shriveling, and be free from fungal infection, insect damage, sprouting, and softening. The internal flesh colour should be a uniform white. Bruised or skinned eddoes should not be exported.



**Figure 5. Uniform sized eddoes packed for export to Barbados.**

### *Packing*

The surface of the eddoe should be completely dry before packing. Packing of wet or damp eddoes will result in mould growth on the surface of the corm, decay, and possible sprouting during storage and transport. Eddoes for export should be loose-packed in strong well-ventilated fiberboard cartons (Figure 6). The ideal export container is a double-walled two-piece full telescopic carton with a bursting strength 275 to 300 lb per square inch. Where staples are used to assemble the carton, care should be taken to ensure complete staple closure to avoid damage to the eddoes. Net



**Figure 6. Uniform sized eddoes packed in fiberboard carton exported to Toronto.**

carton weight depends on the market destination and importer requirements. The most common carton sizes are 18.2 kg (40 lb) and 23 kg (50 lb). For sea shipments, an additional 5% weight should be added to each carton to account for weight loss during shipment. However, the cartons should not be over-filled so the eddoes bulge out from the top.

Mesh bags or synthetic sacks do not provide adequate protection to the eddoes (Figure 7). Considerable bruise damage and injury to the corms is likely to occur during loading and unloading, and in-transit while the bags are stacked on top of each other. Bags or sacks should not be filled with more than 23 kg (57 lbs) of product.



**Figure 7. Eddoes packed in mesh bags are not adequately protected from bruising injury.**

### **Principal Postharvest Diseases**

Eddoes should be harvested with care to minimize the amount of wounding and handled gently during all stages of market preparation. Infection by fungal and bacterial organisms is generally the most serious cause of postharvest loss. The majority of the micro-organisms that cause spoilage are soil-borne and are present on the surface of the eddoo at harvest. Disease incidence can be reduced by minimizing the amount of injury to the corm, proper curing, holding the eddoes at 11°C (52°F), and using clean sanitized wash water (150 ppm hypochlorous acid maintained at a pH of 6.5). Infection typically begins where skin damage or abrasion has occurred. Washing with non-chlorinated water will increase postharvest disease, since the microbial inoculum from infected corms will contaminate healthy eddoes. A postharvest fungicide application (500 ppm benomyl or 1000 ppm thiabendazole) may also reduce the amount of decay.

#### *Blue Mould*

Blue mould is a common postharvest disease of eddoes. Typical symptoms include a blue mould growth associated with cut or damaged surfaces. In some cases, the inside of the eddoo may rot without any exterior symptoms. The rotted tissue is pale to dark brown, and may be firm or soft. Corms are likely to be contaminated at harvest, and infection occurs via wounds. Decay continues to develop at temperatures below 20°C (68°F).

#### *Botryodiplodia Rot*

Rot caused by the soil-borne fungus *Botryodiplodia theobromae* is a common postharvest decay of eddoo. Infection typically occurs via injuries at the time of harvest.



**Figure 8. Internal tissue decay symptoms caused by *Botryodiplodia* rot.**

There may be no external symptoms, even when decay is advanced. Internal tissue initially turns gray or pink, later darkening to blue-black with an indistinct separation between diseased and healthy tissue (Figure 8). Flesh texture becomes spongy, but in the presence of secondary decay organisms a wet rot may develop. At ambient storage temperatures rotting is rapid. Eddoe put in storage should be inspected every two weeks and partially decayed corms should be discarded.

#### *Rhizopus Soft Rot*

Soft rot, caused by the fungus *Rhizopus*, is a common storage rot of eddoes that rapidly develops under ambient conditions. Symptoms include a soft, watery rot that progresses rapidly and may rot an entire eddoe in 4 to 5 days. The skin of the corm generally remains intact until the rot is very advanced. If the skin is broken, a coarse white mould develops. Decayed tissue is soft and pale, with a cheesy or watery consistency and a slight yeasty odour. An abundance of fruit flies in the storage area usually indicates the presence of the disease. The postharvest fungicide 2,6-dichloro-4-nitroaniline (Botran) may be applied after cleaning to reduce the risk of *Rhizopus* development in the packed cartons during marketing.

#### *Sclerotium Rot*

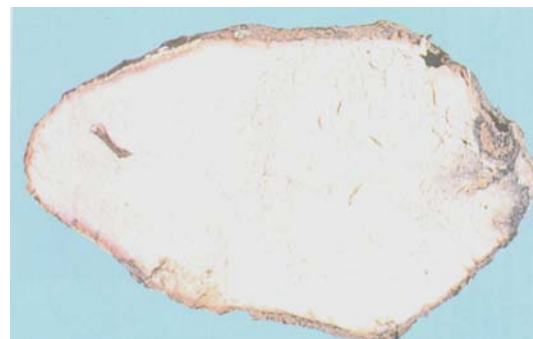
Sclerotium rot infection, caused by the soil-borne fungus *Sclerotium rolfsii*, begins at or near the soil surface. Eddoe which is under drought stress is more susceptible to this disease. Symptoms of decay include a sharply defined margin between rotted and healthy tissue. In humid conditions there is a widespread development of white mould on the eddoe surface (Figure 9). Rotted internal tissue is pale brown to pinkish, soft but not watery, and somewhat stringy.



**Figure 9. White mould growth on eddoe infected with *Sclerotium* rot.**

#### *Pythium Rot*

Pythium rot may be a serious postharvest fungal disease on eddoes grown in poorly drained soils. Healthy corms may become infected through wounds sustained during harvesting and handling. Serious decay can develop within several days of harvest. Symptoms of infection include pale and soft internal tissue, with a crumbly or cheesy consistency (Figure 10). The infection lesion is bounded by an irregular but sharply defined margin, beyond which is a wide, pale brown zone of firm un-decayed tissue.



**Figure 10. *Pythium*-infected eddoe tissue is pale and has a crumbly consistency.**



### *Fusarium Rot*

The fungus *Fusarium* is another common soil-borne pathogen that infects eddoe corms. Infection is typically associated with wounds or insect and nematode damaged tissue. Decay usually begins at the base or side of the corm. Symptoms of *Fusarium* infection include dry, off-coloured, spongy tissue bordered by a distinct brown margin (Figure 11). In humid environments, the eddoe surface may become covered with dense white mould.



**Figure 11. Distinct brown margin of eddoe flesh tissue infected with *Fusarium* rot.**

### *Bacterial Soft Rot*

Bacterial soft rot, caused by *Erwinia chrysanthemi* or *E. carotovora*, is the principal postharvest bacterial disease of eddoes. These bacteria are widespread and enter the eddoe via wounds. Symptoms of bacterial soft rot damage include a slimy, soft rot of the tissue, which is accompanied by a strong foul smelling odour. Development of this disease is rapid under warm, humid conditions.

## **Postharvest Disorders**

### *Sprouting*

Eddoe corms do not have a natural dormancy after harvest. Sprouting may occur when eddoes are stored above 15°C (59°F). The rate of sprouting will be more rapid with increasing temperature (Figure 12).



**Figure 12. Sprout initiation from cut eddoe at ambient temperature.**

### *Chilling Injury*

Eddoes are susceptible to low temperature chilling injury (CI) if exposed to 10°C (50°F) or below. Symptoms of CI include sunken lesions and pits on the surface of the eddoe, internal flesh darkening, increased water loss, increased susceptibility to postharvest decay, and detrimental changes in flavour. The severity of CI depends on the temperature and length of exposure below 10°C (50°F). The amount of damage from CI will be greater as the temperature decreases and the length of exposure time increases. Slight injury may occur in as soon as 5 days at 8°C (46°F) or 2 days at 4°C (32°F). The symptoms of CI are often not noticeable until the eddoes are returned to a higher temperature.

## **ANNEX I**

### **PUBLICATIONS IN THE POSTHARVEST HANDLING TECHNICAL BULLETIN SERIES**

PH Bulletin No. 1	Pineapple: Postharvest Care and Market Preparation, November 2002.
PH Bulletin No. 2	Plantain: Postharvest Care and Market Preparation, June 2003.
PH Bulletin No. 3	Mango: Postharvest Care and Market Preparation, June 2003.
PH Bulletin No. 4	Bunch Covers for Improving Plantain and Banana Peel Quality, June 2003.
PH Bulletin No. 5	Papaya: Postharvest Care and Market Preparation, June 2003.
PH Bulletin No. 6	Watermelon: Postharvest Care and Market Preparation, October 2003.
PH Bulletin No. 7	Peppers: Postharvest Care and Market Preparation, October 2003.
PH Bulletin No. 8	Oranges: Postharvest Care and Market Preparation, October 2003.
PH Bulletin No. 9	Tomato: Postharvest Care and Market Preparation, October 2003.
PH Bulletin No. 10	Okra: Postharvest Care and Market Preparation, October 2003.
PH Bulletin No. 11	Pumpkin: Postharvest Care and Market Preparation, January 2004.
PH Bulletin No. 12	Lime: Postharvest Care and Market Preparation, January 2004.
PH Bulletin No. 13	Grapefruit: Postharvest Care and Market Preparation, January 2004.
PH Bulletin No. 14	Passion Fruit: Postharvest Care and Market Preparation, January 2004.
PH Bulletin No. 15	Green Onions: Postharvest Care and Market Preparation, January 2004.
PH Bulletin No. 16	Sweet Potato: Postharvest Care and Market Preparation, January 2004.
PH Bulletin No. 17	Eggplant (Boulanger): Postharvest Care and Market Preparation, January 2004.
PH Bulletin No. 18	Avocado (Pear): Postharvest Care and Market Preparation, January 2004.
PH Bulletin No. 19	Bitter Melon: Postharvest Care and Market Preparation, January 2004.
PH Bulletin No. 20	Bora: Postharvest Care and Market Preparation, April 2004.
PH Bulletin No. 21	Cassava: Postharvest Care and Market Preparation, April 2004.

PH Bulletin No. 22      Eddoes: Postharvest Care and Market Preparation, April 2004.

PH Bulletin No. 23      Ginger: Postharvest Care and Market Preparation, May 2004.

### **OTHER PLANNED PUBLICATIONS**

Breadfruit: Postharvest Care and Market Preparation.

Cabbage: Postharvest Care and Market Preparation.

Calaloo: Postharvest Care and Market Preparation.

Coconut: Postharvest Care and Market Preparation.

Cucumber: Postharvest Care and Market Preparation.

Lemon: Postharvest Care and Market Preparation.

Starfruit: Postharvest Care and Market Preparation.

Tangerine: Postharvest Care and Market Preparation.

Yam: Postharvest Care and Market Preparation.

### Harvest Maturity Indices

The time period from planting is a rough measurement of when to begin harvest. Eddoes generally require a minimum of six months to mature, however, this may be extended to 8 or 9 months, depending on the growing conditions, cultivar, and desired market size.

The vegetative condition of the plant is also commonly used as a measure of harvest maturity. The older, outer leaves begin to turn yellow and age as the eddoe approaches maturity. The length of new stem growth also becomes shorter. Harvesting should begin when the leaves of the majority of plants have naturally aged and turned yellow or dry. Eddoe can remain in the ground several months after leaves age and yellow; this allows the bulbs to get bigger. However, harvest should not be delayed too long because the inner part of the eddoe bulb becomes woody and inedible with age.

Bulb size is the other good measure of harvest maturity. When eddoes have reached their full size, they often begin to push out of the soil surface. This is a sign that the crop should be harvested soon. Randomly selected plants should be dug at different times and locations to estimate the average eddoe size in the planting.

### Harvest Methods

Eddoe is typically harvested by hand by lifting the lower part of the stem in a shaking motion and pulling the plant out of the ground. A harvest tool (fork or cutlass) may be used to help lift the eddoe out of the ground. Care must be taken during harvest to minimize damage to the bulb, as this reduces market life. Once harvested, any large pieces of soil should be rubbed off the eddoe surface.

If the eddoes are intended to be sold immediately, the stem should be cut back to right above the shoulder of the bulb. If the eddoe is to be cured and stored, a slightly longer length of stem, sticking out above the shoulder by about 2 to 3 cm (1 inch), should be left attached to the bulb. The tail end of the bulb should also be cut back so that 1.3 cm (0.5 inch) stalk remains. All seriously injured, or partially decayed bulbs should be sorted out in the field at the time of harvest

Eddoes intended for market should be carefully put into appropriate harvest container and taken to a shaded and open air collection area or packing site. The ideal harvest containers are well-ventilated wooden crates or durable plastic containers. Large synthetic sacks are not appropriate for harvesting as considerable bruising and surface cuts to the bulbs can result.

### Curing

Curing is a process in which the skin thickens and new tissue forms beneath the surface of injured areas on the bulb. Curing also reduces postharvest water loss and minimizes decay during storage. The best conditions for curing eddoes are 26.5°C to 30°C (80°F to 86°F) and 90% to 95% relative humidity for several days immediately following harvest. Eddoes can be cured outdoors if piled in a partially shaded area. Cut grasses or straw can be used as insulating materials and the pile should be covered with canvas, burlap or reed mats.



Eddoes should never be washed or scraped clean before curing and/or storage, as this may cause decay. After curing, eddoes should be stored in well-ventilated bins or crates, and washed only before packing for market.

### Temperature Control

The ideal storage temperature for eddoes is 11°C (52°F). At this temperature, properly cured and healthy bulbs can be stored for 3 months. Storing eddoes at normal outside temperatures will significantly shorten the storage life. Intact bulbs will typically remain in a marketable condition for only up to 3 weeks at 22°C (72°F). Eddoes that have been cut off at the ends and/or had the skin removed will have a potential market life of only 2 weeks due to a higher rate of decay and weight loss. Temperatures above 15°C (59°F) lead to sprouting and a high weight loss.

Eddoes are vulnerable to chilling injury (CI) if exposed to 10°C (50°F) or below. Symptoms of CI include sunken holes and pits on the bulb surface, dark internal flesh, postharvest decay, and poor flavour. The amount of damage from CI will be greater as the temperature decreases and the length of exposure time increases. Injury may occur in as soon as 5 days at 8°C (46.4°F) or 2 days at 4°C (39°F).

### Relative Humidity

Moisture loss, shriveling, and softening are common postharvest problems with eddoes. In order to minimize these problems, the relative humidity (RH) should be maintained at 90% to 95% during storage. Storing eddoes above 95% RH is not recommended because of surface discolouration and mould growth.

### Preparation for Market

#### *Cleaning*

For the domestic market, excess soil should be removed from the eddoe surface with a soft brush or cotton gloves. The skin should not be scraped with a knife nor should the base part of the bulb be cut.

Due to a protocol required by the government, eddoes destined for Barbados have to be completely scraped clean and washed. This can cause open wounds in the eddoe tissue and significantly diminishes potential market life.

Eddoes should only be washed if the market requires it, or if the bulbs are very dirty with soil. The water should be clean and sanitized with 150 ppm hypochlorous acid. This is equal to 2 oz of household bleach (such as Marvex) per 5 gallons of water, or .3 liters of bleach per 100 liters of water. The water should be maintained at a pH of 6.5. The bulbs should remain in the chlorinated water for 30-60 seconds. The wash water should be changed regularly to prevent the build-up of soil particles and micro-organisms. Eddoes can be further protected against postharvest decay by dipping in a 500 ppm benomyl or 1000 ppm thiabendazole fungicide solution after washing. Benomyl (500 ppm) should be measured at 6.6 oz to 5 gl water (0.2 l benomyl to 19 l of water). Thiabendazole (1000ppm) should be measured as 13.2 oz. to 5 gl waters (390 ml to 19 l). The surface of the eddoes should be thoroughly dried before grading by placing them on a table in a well-ventilated area.



#### *Grading*

Damaged and partially decayed bulbs should be removed from those intended for market. Carton should be packed with sound bulbs of the same size and shape. High quality eddoes are large, dark brown, and fresh in appearance. The bulbs should not be soft, spongy, or puffy. They should not have any visible dirt, damage, and surface mould. Export markets typically require large sized eddoes between 1 to 1.5 kg (2.2 to 3.3 lbs) in weight. The bulbs should have skin over the entire surface, no shriveling, and be free from fungal infection, insect damage, sprouting, and softening. The internal flesh colour should be a uniform white.



### *Packing*

The surface of the eddoe should be completely dry before packing. Eddoes for export should be loose-packed in strong well-ventilated fiberboard cartons. The most common carton sizes are 18.2 kg (40 lb) and 23 kg (50 lb).



### **Principal Postharvest Diseases**

The majority of the micro-organisms that cause damage are soil-borne and are present on the surface of the eddoe at harvest. Infection typically begins where skin damage or abrasion has occurred. Disease can be reduced by minimizing the amount of injury to the bulb, proper curing, storing the eddies at 11°C (52°F), and using clean sanitized wash water (150 ppm hypochlorous acid maintained at a pH of 6.5). A postharvest fungicide application (500 ppm benomyl or 1000 ppm thiabendazole) may also reduce the amount of decay.

#### *Blue Mould*

Typical symptoms include a blue mould growth on cut or damaged surfaces. In some cases, the inside of the eddoe may rot without any exterior symptoms. The rotted tissue is pale to dark brown, and may be firm or soft.

#### *Botryodiplodia Rot*

There may be no external symptoms, even when decay is advanced. Internal tissue initially turns gray or pink, later darkening to blue-black with an indistinct separation between diseased and healthy tissue. The texture of the flesh usually becomes spongy.

#### *Rhizopus Soft Rot*

Symptoms include a soft, watery rot that progresses rapidly and may rot an entire eddoe in 4 to 5 days. The skin of the bulb generally remains intact until the rot is very advanced. If the skin is broken, a coarse white mould develops. Decayed tissue is soft and pale, with a slight yeasty odour. The postharvest fungicide 2,6-dichloro-4-nitroaniline (Botran) may be applied after cleaning to reduce the risk of soft rot development in the packed cartons during marketing.



#### *Sclerotium Rot*

Sclerotium rot begins at or near the soil surface. Symptoms of decay include a sharply defined margin between rotted and healthy tissue. In humid conditions there is a widespread development of white mould on the eddoe surface. Rotted internal tissue is pale brown to pinkish, soft, and somewhat stringy.



#### *Pythium Rot*

Pythium rot may be a serious postharvest fungal disease on eddies grown in poorly drained soils. Symptoms of infection include pale and soft internal tissue, with a crumbly or cheesy consistency. The infection results in an oddly shaped but sharply defined margin between decayed and healthy tissue.

#### *Fusarium Rot*

Decay usually begins at the base or side of the bulb. Symptoms of fusarium infection include dry, off-coloured, spongy tissue bordered by a distinct brown margin. In humid environments, the eddoe surface may become covered with dense white mould.

#### *Bacterial Soft Rot*

Symptoms of bacterial soft rot damage include a slimy, soft rot of the tissue, which is accompanied by a strong foul smelling odour.

**Technical bulletins are also available on waxing fruits and vegetables and curing. Contact:**

New Guyana Marketing Corporation (NGMC) 87 Robb & Alexander Sts., Georgetown, Guyana  
Tel: 226-8255, 226-2219

National Agricultural Research Institute (NARI)  
Mon Repos, East Coast Demerara, Guyana  
Tel: 220-2950



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**New Guyana Marketing Corporation**

# EDDOE

## Postharvest Care and Market Preparation Information Sheet



*This information sheet provides growers and agriculture extension personnel with a summary of the recommended harvest and postharvest handling practices for eddoe. A more technical and detailed bulletin is available from the New Guyana Marketing Corporation (NGMC) and the National Agricultural Research Institute (NARI).*